ICS18 - study questions

January 23, 2019

1. What is the broad and what is the narrow notion of **cognition**?
2. What is **representation**? Enumenrate examples of representations considerd within different disciplines (cog. psychology, neuroscience, AI) and show that they fulfill the definitional requirements
3. Enumerate and characterize briefly key **cognitive disciplines**
4. Key theses and principles of **associationism**
5. How to explain a mind: pure vs mixed associationism
6. A mind according to **behaviorists**
7. Why is behaviorism considered "the **scientific psychology**"?
8. Why behaviorism (as a theory of mind) was rejected?
9. Find the elements of behaviorism within contemporary cognitive theory of mind (either symbolic or connectionist)
10. Describe **Turing Machine** as a computational device
11. What is **computation**? (remember the roll of toilet paper...)
12. The idea of a mind as a "**logic machine**" (McCulloch, Pitts)
13. What features does a McCulloch-Pitts neuron have?
14. What is the main difference between a McC-P neuron and a perceptron?
15. What is a model? (cf. Kenneth Craik&Minsky)
16. What are the assumptions of phrenology?
17. **Localizationist** view on a brain (Gall, Spurzheim)
18. **Holistic** approaches to human brain
19. What does it mean that some part of our body has a "topographic representation" in the brain?
20. The consequences of **Broca's and Wernicke's discoveries** for a cognitive view on a brain
21. What is **Brodmann** famous for?
22. What did **Golgi** invent? What consequences had his discovery?
23. Describe **Cajal's** discoveries and their influence on neuroscience
24. The key aassumptions of the "**neuron doctrine**" (Cajal)
25. Characterize the **structure of a neuron** and describe the functions of its main parts
26. What is a **glial cell** (and how does it function)?
27. Describe the **key methods** in cognitive neuroscience: (a) single cell recording (b) investigation of lesions (c) computer tomography (CT) (d) Magnetic resonance imaging (MRI) (e) Electroencephalography (EEG) (f) Positron emission tomography (PET) (g) functional magnetic resonance imaging (fMRI)
28. Describe the neural process of visual perception
29. Areas of the brain involved in visual processing and **disorders of vision**
30. The idea of a "grandmother cell" in contast to the idea of "**complex feature detectors**" //compare with localized/distributed representations in AI
31. **What is a cognitive architecture**? Enumerate the elements (if applicable) and describe the flow of information within:
   (a) the Atkinson-Shiffrin model
   (b) Levels-of-processing model
   (c) Modular model
   (d) Pandemonium model
   (e) Connectionist models
32. What is a mental module (according to Fodor)? Can you give an example of a modular faculty?
33. The distinction between **declarative** and **procedural knowledge**
34. Enumerate the forms of non-declarative knowledge; provide some examples
35. What is a **concept**?
36. What is a **category**?
37. The **classical view** on categories (based on defining features)
38. The **prototype view** on categories (characteristic features; Rosch)
39. A **semantic network** as a psychological representation: its structure and features
40. Schemas (and scripts) as forms of psychological representations: their structure and features
41. How does a **production system** function?
42. What is cognition (according to computationalists)?
43. Describe **von Neumann machine** as a computational architecture
44. Compare a Turing Machine and von Neumann machine

45. Describe a **production system architecture** (within AI)

46. Compare von Neumann machine and production systems

47. Enumerate forms of representations within AI; describe briefly their features

48. Describe the structure and features of an **artificial** neural network. How can such a network change as a result of learning?

49. What is an **artificial neuron** (a unit)?

51. **Calculate an output** given an input and weights of connections

52. What does it mean: to program an artificial neural network?

53. Finally: so what is Cognitive Science???

Key terms (to be explained): association, stimulus, response, a symbol, symbol manipulation, representation(s), cognition, computation, cognitive psychology, cognitive neuroscience, artificial intelligence, Turing Machine, psychon, threshold, perceptron, open/closed system, model, phrenology, localizationist view, lesion, holistic view, dendrite, axon, synapse, cytoarchitectonics, a neuron, a glial cell, myelin, nodes of Ranvier, CT, PET, MRI, fMRI, retina, rods, cones, temporal lobe, frontal lobe, occipital lobe, parietal lobe, agnosia, achromatopsia, akinetopsia, short-term memory, long-term memory, attention, rehearsal, Fodorian module (an input system), declarative knowledge, procedural knowledge, concept, category, semantic network, node, link, script, production, cognitive architecture, program, algorithm, computational architecture, von Neumann machine, symbolic architecture, connectionist architecture, frame, an operator, unit (of the artificial network), connection, weight of connection, input vector, output vector, distributed representations.

You should remember and associate with particular theories/approaches/notions the following names: William James, Ivan Pavlov, John Watson, Burrhus Skinner, Alan Turing, Warren McCulloch, Walter Pitts, Marvin Minsky, Norber Wiener, Kenneth Craik, Franz J. Gall, Johann Spurzheim, John H. Jackson, Paul Broca, Karl Wernicke, Korbinian Brodmann, Camillo Golgi, Ramon y Cajal, Karl Lashley, Stephen Kosslyn, Noam Chomsky, Herbert Simon, Alan Newell, Jerome Bruner, George Miller, Jerry Fodor, Richard Atkinson, Richard Shiffrin, James McClelland, David Rumelhart, Oliver Selfridge, Eleonor Rosch, John von Neumann, Ross Quillian, John Anderson

Good luck,

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